Proper Understanding of Combustion Dynamics Leads to Possibility of Unconventional Heat Generation via Continual Combustion of Graphite (Low-Grade Homogeneous Combustion)

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Introduction

Combustion dynamics are currently described in chemistry textbooks as involving the "donation of electrons" from combusting materials to oxidizers. This description is not merely vague, but erroneous. Such a description seeks to describe a process that rightly is in the domain of physics in the vernacular of a chemist. By reconsidering the nature of combustion dynamics, new possibilities are opened for energy-to-heat conversion and the endless reuse of combustive fuels.

Abstract

Carbon has, for the history of the study of combustion, been viewed as an inert byproduct of combustion rather than as a potential source of exothermic energy. Traditional chemical combustion involves the conjunction of hydrogen atoms (generally attached to carbon atoms in hydrocarbons) with an oxidizer such as oxygen or fluorine.

It is firstly important to understand why this reaction is exothermic as well as to understand the behavior of these hydrogen atoms over short timescales as they chemically bond with oxidizers despite an extant, weaker bond with carbon.

In a conventional combustion reaction, large quantities of heat result in large numbers of close approaches of fuels (such as hydrocarbons) with oxidizers (such as oxygen in the atmosphere.) Without these large numbers of approaches and without, furthermore, instability in the magnetic orientation of individual electrons in the valence shell of carbon, there is insufficient opportunity for hydrogen atoms to be liberated. This sub-dynamic of combustion is a province of physics, not of chemistry.

When sufficiently high temperatures are reached, a hydrogen may detach from a carbon as a result of thermal energy altering the positional dynamics of electrons in the valence ring of carbon. As a nucleus of carbon, for instance, makes repeated close approaches to the electron cloud, large numbers of electrons congregate transiently in specific areas of the cloud. In close proximity, these electrons tend to direct their north and south poles toward one another, meaning that a dynamic of a 45-degree orientation of the discrete magnetism of these electrons may not come about for millions of consecutive orbits (up to a millisecond at a time,) this being a sufficiently long length of time for a hydrogen to be released and to drift away from the carbon.

In proximity to an oxidizer with a larger number of electrons in the valence shell, (oxygen having six as opposed to carbon's four,) a stronger bond exists which cannot be broken by temperatures of merely 450 degrees Fahrenheit (hydrogen's bond within water molecules requiring electrical arcs in order to bring about separation, implying much greater levels of force being required when greater number of valence electrons underpin the bond.)

These separations from carbon are not instantaneous, but, in fact, involve a tug of war between oxidizers and carbons in which hydrogen is repeatedly pulled between the carbon and the oxygen over extremely short timescales before ultimately becoming bound to the oxidizer. This motion generates thermal energy as a result of Coulomb forces exerted by the rapidly oscillating hydrogen during both the process of separation from carbon as well as the process of conjunction with oxygen. This sort of dynamic is, in fact, the only one that explains why fuels with a carbon base produce more BTUs of energy than pure hydrogen despite hydrogen being more volatile. Hydrogen can be useful for generating intense pressure waves upon combustion (making it useful for rocketry) but would make a poor fuel for heating applications.

Thus, a tug-of-war between carbon and oxygen transpiring over up to a millisecond and the associated Coulomb attraction and repulsion resulting from this oscillation explains why hydrocarbons have a greater thermal energy density than pure hydrogen. The energy is not, as many believe, stored in the hydrocarbon as potential energy, but is, in fact, a consequence of the conversion of entropic energy in electrons into mechanical motion in hydrogen which is ultimately translated into thermal energy.

The recognition of the true dynamics that make this phenomenon possible opens the door to a novel type of combustion that has never before been observed which may be termed Low-Grade Homogeneous Combustion or LGHC for short. Under specific conditions, the configuration of carbon known as graphite may be caused to combust in the absence of any other chemical. This is to say that the weak bond of four valence electrons in any two carbon atoms may be continually broken and re-established through a harmony of forces. While these weak bonds do not generate large quantities of heat energy when broken or re-established, large numbers of combustion events of this sort (combustion being defined as any separation of one atom from another when dealing with molecules) can enable the conversion of the energy used to bring about these separations and re-combinations into heat energy.

Anyone who has ever handled loose graphite knows that flakes of graphite may readily disintegrate and recombine. Each time atomic separations of graphite occur, marginal heat is necessarily generated. Heat, if our above premise is accurate, is also generated when graphite atoms form connections with others in the process of creating the long, meandering chains of carbon we call graphite. This contradicts the assumption by chemists, long held as gospel, that the recombination of combustible elements is necessarily endothermic.

This hypothesis may be tested inexpensively by simultaneously infusing vibrational energy to create large numbers of separations of graphite atoms and infusing helical light (which would create small-scale magnetic eddies in graphite in addition to conventional light-to-heat conversion) in order to generate the reconnection of large numbers of carbon atoms.

Relative to the amount of energy required to power the acoustic and optical components of such a mechanism, bulks of loose graphite should generate, if this hypothesis is accurate, more heat than expected. Depending upon the level of heat generated, this approach may even constitute a practical heating mechanism of greater efficiency than others currently in use.

Conclusion

It would be interesting to compare the efficiency of this type of heat conversion to the heat conversion theoretically predicted in certain bleaching molecules when they interact with light, which is underpinned by yet another unexplored mechanism (intra-molecular electron exchange.)